7. In Natural Science the student seeks through a study of natural phenomena the law or laws that express the order of the whole.

8. Nature Study, properly understood, suggests to the youngest child some relationships that give a clue to law. The suggestion of law is the only natural stimulus in any study. The age of the pupil is irrelevant.

There is no natural dividing-line, therefore, between the student of Natural Science and the pupil in Nature Study. The motive, matter, and method in Natural Science and Nature Study are the same, but in instruction there are differences in the application of the common principles.

1. The child's senses are untrained; he observes less of detail than the better trained student of nature.

2. In Nature Study larger masses, therefore, must be presented to the child than would be necessary in the case of the advanced student. The sights must be more striking, the weights, relatively, heavier, the movements more pronounced, the functions more obvious.

3. In Natural Science the better trained student discovers minuter details and recognizes more delicate relations.

4. Hence to the beginner the outdoor study is of maximum and the laboratory is of minimum importance; but to the advanced student, if he can carry his outdoor experience with him, the laboratory becomes relatively of greater importance.

5. Quantitative results in Nature Study are possible and proper in any particular field of study where the student of Natural Science would find it necessary to obtain them. But where the advanced student might obtain the desired information by the analysis of a single leaf, or of a drop of water or an ounce of earth, the beginner in Nature Study must use bushels, gallons and pounds. This for two reasons: First, the beginner must deal with large quantities if he is to image properly; and second, the liability to loss during the experiment, owing to lack of skill in manipulation, is greater. True Nature Study, therefore, is Natural Science, and its methods are all scientific. The student in the latter should not find it necessary to unlearn, ignore, or forget what he learned in the former.

Physiology of Nutrition

Ira B. Meyers

(With Special Reference to the Human Body.)

Ninth Grade: The Physiology for the quarter is a study of the animal organism as related to nutrition.

The structure of the digestive organs of any animal is determined by the nature of the food consumed. The food material is more or less solid and insoluble, and is for the most part of a composition differing from the tissues it is intended to build or repair. The function of the organs of digestion is to change the food so that it may be utilized by the tissues of the body.

This series of changes involves two processes—a physical one by which the food is triturated, moved along the digestive tract, and mixed with certain fluids, and a chemical process which changes insoluble substances into soluble ones, thus modifying the food in such a way that the larger part eaten passes directly or indirectly into the blood.

To understand the problems involved in these processes, structure and function must be studied together. Knowing that an animal lives on solid food is sufficient to explain the need of teeth; knowing the physical nature of the food, and the animal's method of prehending it, explains variations in position, form, and size. That this solid food must be reduced to a liquid state explains the need of watery secretions, but to understand the action of these several secretions on the food demands a knowledge of the nature of the food-stuffs (proteids, carbohydrates, fats, minerals), and the effect of these secretions upon each class.

The effort in this course will be to trace the various relations of the digestive organs and their secretions to foods.

Materials used in the quarter's study: Skulls of dog, cat, sheep, hog, squirrel, man.

Models of stomachs of dog, cow, hog, man.

Microscopic slides showing sections of various glands, organs and tissues.

Manikin of the human body (Auzoux).

Dissection of small animal showing organs of digestion.

References: Foster, *Text Book of Physiology;* Martin, *The Human Body;* Colton, *Manual of Physiology;* Orton, *Comparative Zoölogy;* Atwater, *Chemistry and Economy of Food.*

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Outline of Course

I. Prehension of food.

1. Various means in which animals seize their food.
2. Influence upon the animal's habits.

II. Examination of teeth of the various animal skulls.

1. Structure of teeth.
   (*a*) Variations in different animals.
   (*b*) Variations in the same animals.
2. Relation of lower to corresponding upper teeth.
3. Movement of lower jaw.
4. Mechanical effect on food of the animal.
5. Special study of human teeth.

III. Insalivation and swallowing.

1. Function of saliva. Salivary glands, location, structure. Rate of secretion.
2. Muscular action of tongue, cheeks, etc., in mastication.
3. Œsophagus. Structure, muscular action.

IV. Stomach.

1. Location. Structure, form, movement, secretions.
2. Food changes in stomach.

V. Intestines.

1. Structure, position, movements, secretions.
2. Food changes in intestines.

VI. Mechanics of absorption.

Chemistry

Alice P. Norton

Eleventh and Twelfth Grades: The course will be presented in a way to give a definite purpose to the chemical investigations. Individual work will be done and the special interests of each pupil considered.

The work for October and November will consist of:

I. The study of autumn fruits and leaves.

1. Determination of composition as to (*a*) Water. (*b*) Combustible substance. (*c*) Ash.

The amount of water present to be ascertained by weighing, drying, and weighing again. Comparison of amount of water in different fruits and in fresh and dry leaves; students to devise, if possible, a method for collecting and condensing the moisture driven off, part of dry substance to be preserved for future use. A weighed portion to be burned and the percentage of ash or mineral matter calculated. The ash to be preserved for future investigation.